rooted opinion that prevented Watt and Cavendish from doing full justice to their own theory; while Lavoisier, who had entirely shaken off these trammels, first presented the new doctrine in its entire perfection and consistency.

We thus see that each of these eminent men played an independent and, we may say, an equally important share in the establishment of one of the greatest scientific truths that the eighteenth century brought to light.

As regards Watt, the history of this incident serves to bring out only more clearly what we know to be the true character of the man. It illustrates the vigour of his intellectual grasp, the keenness of his mental vision. At the same time it exhibits his love of truth for truth's sake; his unaffected modesty, and the sense of humility that was not the less real because accompanied by a sense of what his inherent love of rectitude taught was due also to himself. The voice of envy and detraction has not been unheard amongst the strife of partisans in the Water Controversy, but throughout it no syllable has been breathed that reflected even remotely upon his honour and integrity.

SCIENTIFIC SERIALS.

Several contributions of anthropological interest appear in the January and February issues of *Globus*.—An old Mexican terra-cotta figure in the American Museum of Natural History is described and figured. It was discovered near Texcoco, and represents a warrior in a padded coat of mail. The figure is of life-size, and its workmanship is peculiar to Mexican antiquities.—A description of the temple-pyramid of Tepoztlan, by Dr. E. Seler, contains not only interesting details, but several very good illustrations of the plan and construction of the temple. Tepoztlan is the place where the Mexican kings had their famous pleasure gardens, and the inhabitants have preserved their ancient language and many of their old customs in their mountain home. The temple lies 2000 feet above the town on a cliff. The ruins consist of several buildings of all kinds and sizes, which are suggested to have been the dwellings of the priests. The temple itself has massive walls built of black and red volcanic stone. The inner space is divided into two rooms by a door let in a thick wall. In the inner room was found a rectangular cavity containing coal and two pieces of copal, showing probably that here was the place where the holy fire was burnt. The door leading to the inner room is flanked by two pillars, richly carved, but the most interesting feature of the room is its benches of sculptured stone. In this room stands an idol, and there were found two pieces of sculpture: one a bas-relief painted in dark red, the other a relief of a Mexican king's crown. Altogether, this is a notable discovery; and if it is really the fact that these people have preserved their ancient culture, it is greatly to be hoped that a scientific exploration will be undertaken before it is too late.—Another people of South America is noted in a paper by Dr. Ehrenreich on the Guayaki in Paraguay. Their territory is bounded on the east and south by Parana, on the north by the rivers Acaray and Monday, and on the west by well-wooded hills. Very little is known about them, and only few ethnographical specimens have found their way into museums. The personal possessions of the people consist of a conical-shaped cap made out of a jaguar skin, chains made of pierced teeth and bones of animals, stone axes, bows and arrows, lances made out of the bark of the palm, and a sharp instrument made out of animal bones. Their vessels are particularly remarkable. Some are egg-shaped, and obviously intended to fix in the ground, and most of them belong to the so-called basket pottery. Several illustrations accompany the paper, including three photographs of a Guayaki man. He is very short, with strikingly short legs, long arms, broad shoulders, short neck and large head. They live entirely as huntsmen, without any tillage, and the very primitive character of the race suggests that they, and possibly other tribes on the boundary line of Brazil, would reveal much information of value to the anthropologist.—An account of the Moplahs of the coast of Malabar, by Dr. Emil Schmidt, is exceedingly useful. They are partly of Hindoo and partly of Arabian origin, and the mixture is shown in their customs. In the north the young husband settles in his wife's house, and the woman's right of succession is admitted; in the south, male succession is the rule. A careful study of these mixed peoples is much needed.—Dr. Nehring gives an account of the worship of the ringed snake among the old Lithuanians, Samoyitians and Prussians.—A paper by Mr. C. G. Hoffman, on the Niggers of Washington, contains some notes on the curious superstitious practices of the Voodoo, said to be a survival of the old religion.—Mr. Christian Jensen's paper on the grave mounds and giants' graves in the islands of North Friesland, contains information of special interest to English folk-lorists who have followed Mr. MacRitchie's ingenious explanation of some fairy beliefs.

SOCIETIES AND ACADEMIES

London.

Royal Society, March 10.—"On the Relative Retardation between the components of a Stream of Light produced by the passage of the Stream through a Crystalline Plate cut in any direction with respect to the Faces of the Crystal." By James Walker.

If the surface of the plate be the plane of xy, the positive axis of z being directed inwards, the relative retardation is $T(n_1 - n_2)$, where the velocity of light in air is unity, T is the thickness of the plate, and n_1, n_2 are the positive roots of a biquadratic in n obtained by expressing that $lx + my + nz = 1$ is a tangent plane to the wave-surface. Writing the roots of the biquadratic as series proceeding by powers of sin i, and expressing the coefficients (which are linear functions of sin i) as symmetrical functions of the roots, the terms of the series may in general be determined in succession by means of linear equations, and have the form $\pm \alpha' + \gamma$, $\pm \alpha'' - \gamma$, where

$$\alpha = \alpha_0 + \alpha_1 \sin i + \alpha_2 \sin^2 i + a_4 \sin^4 i + \ldots,$$

and

$$\gamma = \gamma_3 \sin^3 i + \gamma_5 \sin^5 i + \ldots,$$

while the relative retardation is

$$T(\alpha' - \alpha'' + 2\gamma).$$

This method fails when the plate is perpendicular to an optic axis, in which case the biquadratic may be written

$$n^4 + (c_0 + c_2 \sin^2 i) n^2 + b_3 \sin^3 i \, n + a_0 + a_2 \sin^2 i + a_4 \sin^4 i = 0.$$

Neglecting the coefficient of n, the roots are

$$\pm(\pi + \rho),\ \pm(\pi - \rho),$$

π and ρ being series proceeding by even and odd powers of sin i respectively. Assuming that the actual roots are

$$\pi + \rho + \alpha,\ - \pi - \rho + \beta,\ \ldots$$

the successive terms of the series α, β, γ, δ are determined as in the former method, and, as for terms of the fourth order, have the form

$$\alpha = -\gamma = a_2 \sin^2 i + a_3 \sin^3 i + a_4 \sin^4 i,$$

$$\beta = -\delta = a_2 \sin^2 i - a_3 \sin^3 i + a_4 \sin^4 i,$$

so that

$$\Delta = 2T(\rho + \alpha).$$

Geological Society, March 23.—W. Whitaker, F.R.S., President, in the chair.—The Eocene deposits of Devon, by Clement Reid. A re-examination of the area around Bovey has led the author to think that Mr. Starkie Gardner is probably right in referring the supposed Miocene strata to the Bagshot period. Lithologically as well as botanically the deposits in Devon and Dorset agree closely. The gravelly deposits beneath the Bovey pipeclays are also shown to belong to the same period, and not to be of Cretaceous date. This correction has already been applied by Mr. H. B. Woodward to a large part of the area. The plateau gravels capping Haldon are also considered to belong to the Bagshot period, for they correspond closely with the Bagshot gravels of Dorset to the east, and of the Bovey Basin to the west, and possess peculiarities which distinguish them from any Pleistocene Drift. Several speakers took part in a discussion upon the paper, some agreeing with the author's views, and some were opposed to them.—On an outlier of Cenomanian and Turonian near Honiton, with a note on *Holaster altus*, Ag., by A. J. Jukes-Browne. Although an outlying patch of chalk in the parish of Widworthy was mentioned by Fitton and marked on De La Beche's map, it has not hitherto been described. The tract is about 4½ miles south-west of Membury, 3½ miles east of Honiton, and about 7 miles from the coast at Beer Head.—Cone-in-cone: additional facts from various countries, by W. S. Gresley. Examples of flinty stone in the "fire-clay series" of the Ashby coalfield exhibit "areas of conic structure lying unconformably." In the same stratum of shale are large masses of the same flinty rock, more or less coated with

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conic structures, which appear to have been formed out of layers of shale and ironstone. The bending-up of the shale above the nodules and down below them, the close but unconformable covering of Permian breccia, and the staining of the whole section suggests, if indeed it does not demonstrate, to the author that the growth of the cone-in-cone took place subsequently to the deposit of the Permian breccia. Several American and other examples are described, and a series of conclusions are appended to the paper.

Paris.

Academy of Sciences, March 28.—M. Wolf in the chair.—Preliminary study of a method of estimating carbon monoxide diluted with air, by M. Armand Gautier. It has been shown in previous papers on the same subject, that carbon monoxide is completely oxidised by passing over iodic anhydride at 60°-65°. The present study is concerned with the dilution at which this action ceases. Known volumes of carbon monoxide were mixed with large quantities of air, and the resulting mixture passed over iodic anhydride; the carbon dioxide product was measured by the method of Müntz. It was found that even at dilutions of 1 in 30,000, the quantity of CO present could be accurately determined. Both acetylene and ethylene are oxidised under the same conditions, but only partially, experiments showing that some 10 to 24 per cent. of the former, and 40 to 60 per cent. of the latter were converted into carbon dioxide.—On the use of palladium chloride as a reagent for the detection of minimal quantities of carbon monoxide in the air, and on the transformation of this gas into carbonic acid at the ordinary temperature, by MM. Potain and Drouin. One part of carbon monoxide in 10,000 of air can be detected by this reagent, if it be assumed that no other reducing gas is present, but the method does not yield quantitative results. Atmospheric air containing $\frac{1}{1000}$th part of carbonic oxide, after remaining in sealed flasks for forty-two days, showed no trace of the monoxide, but a nearly equal volume of carbon dioxide. From this it would appear that the monoxide can be slowly oxidised by air at ordinary temperatures.—Observations of Perrine's comet (1898 March 19) made at the Observatory of Paris, by MM. G. Bigourdan and G. Fayet.—Observations of the same comet, made with the large equatorial at the University of Bordeaux, by M. L. Picart.—Observations of Perrine's comet, made at the Toulouse Observatory with the Brunner equatorial, by M. F. Rossard.—Elements of Perrine's comet, by M. J. Lagarde.—Fundamental theorem on the birational transformations with complete coefficients, by M. S. Kantor.—On certain linear functional equations, by M. Lémeray.—Researches of precision on the infra-red dispersion of Iceland spar, by M. E. Carvallo. The measurements agree well with the results of earlier researches, but are accurate to another decimal place.—On the rigorous determination of molecular weights of gases, starting from their densities, and the deviations which they exhibit from Boyle's law, by M. Daniel Berthelot.—Gas engines with high compression, by M. A. Witz. A discussion of the theory of the Diesel engine. — On the Hertzian field, by M. Albert Turpain.—On an iodide of tungsten, by M. Ed. Defacqz. The hexachloride is first prepared by the action of chlorine upon the metal, and this heated to about 400° C. in a current of hydriodic acid. The iodide has the composition WI_2.—Quinolinic bases, by M. Marcel Delépine. Heats of combustion and formation of quinoline, tetrahydroquinoline, quinaldine, and tetrahydroquinaldine. Combination of organic bases with certain oxygen salts. Double salts are described of aniline and toluidine with cadmium, zinc, magnesium, nickel, cobalt, and copper sulphates.—New observations on the evolution of the *Urnes*, by MM. J. Kunstler and A. Gruvel.—On the encephalon of the Glyceræ, by M. Ch. Gravier. In spite of certain peculiarities which are related to the considerable length of the prostomium, the encephalon of the Glyceræ present the same fundamental characters as those of other allied Annelids of which the nervous system has been specially studied.—On the relation between centrosomes and vibratile cilia, by M. L. F. Henneguy.—On the structure of the mycorhizia, by M. Louis Mangin.—On the replacement of a principal stem by one of its ramifications, by M. Auguste Boirivant. When a lateral branch replaces a portion of a principal stem which has been destroyed, it undergoes modifications so profound as to finally more nearly resemble, both in its structure and external appearance, the axis which it replaces, rather than the branch to which it is homologous.—Biochemical preparation of crystallised dioxyacetone, by M. Gabriel Bertrand. By the action of the sorbose bacteria upon glycerine under suitable conditions laid down in this paper, excellent yields of crystallised dioxyacetone are obtained (25 gr. of the latter from 100 gr. of glycerine).—On the treatment of mania by the injection of normal nerve substance, by M. V. Babes.

BOOKS, PAMPHLET, and SERIALS RECEIVED.

Books.—Outlines of Descriptive Psychology: Prof. G. T. Ladd (Longmans).—The Diseases of the Lungs: Dr. J. K. Fowler and Prof. R. J. Godlee (Longmans).—Nippur, or Explorations and Adventures on the Euphrates: Dr. J. P. Peters, 2 Vols. (Putnam).—Simple Lessons in Cookery: M. Harrison (Macmillan).—A Text-Book of Botany: Strasburger, Noll, Schenck, and Schimper, translated by Dr. H. C. Porter (Macmillan).—The Process of Creation discovered: J. Dunbar (Watts).—Respiratory Exercises in the Treatment of Disease: Dr. H. Campbell (Baillière).—Biomechanik erschlossen aus dem Principe der Organogenese: Dr. E. Mehnert (Jena, Fischer).—Fossil Plants for Students of Botany and Geology: A. C. Seward, Vol. 1 (Cambridge University Press).—Bibliography of the Metals of the Platinum Group (Washington).—Philip's Artistic Animal Studies (Outline and Coloured Series), ditto, Fruit Studies, (Philip).

Pamphlet.—Report of S. P. Langley, Secretary of the Smithsonian Institution, for the Year ending June 30, 1897 (Washington).

Serials.—Natural Science, April (Dent).—The Atoll of Funafuti, Part 6 (Sydney).—Sunday Magazine, April (Isbister).—Good Words, April (Isbister).—An Illustrated Manual of British Birds: H. Saunders, 2nd edition, March and April (Gurney).—Contemporary Review, April (Isbister).—National Review, April (Arnold).—Transactions of the Edinburgh Geological Society, Vol. vii. Part 3 (Edinburgh).—Fortnightly Review, April (Chapman).—Psychological Review, Index for 1897 (Macmillan).—Century Magazine, April (Macmillan).—L'Anthropologie, Tome ix. No 1 (Paris, Masson).—Zeitschrift für Physikalische Chemie, xxv. Band, 3 Heft (Leipzig, Engelmann).—Journal of the Royal Agricultural Society of England, Vol. ix. Part 1 (Murray).—Bulletin of the American Museum of Natural History. Vol. ix, 1897 (New York).—Proceedings and Transactions of the N.S. Institute of Science, Halifax, N.S., Vol. ix. Part 3 (Halifax).—Journal of Botany, April (West).

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